

CLAIMS:

1. An olefinic composition comprising a functionalized branched olefin copolymer containing functionalized sidechains derived from olefin and at least one chain end nucleophilic heteroatom containing functional group with at least one protic hydrogen, optionally with one or more copolymerizable monomers, the copolymer having A) a $T_g < -10^\circ\text{C}$ as measured by DSC; B) a $T_m > 100^\circ\text{C}$; C) an elongation at break of greater than or equal to 500 percent; D) a Tensile Strength of greater than or equal to 1,500 psi (10,300 kPa) at 25°C ; E) a TMA temperature $> 80^\circ\text{C}$, and F) an elastic recovery of greater than or equal to 50 percent.
2. The composition of claim 1 wherein the functional group is selected from the group consisting of primary or secondary amines, alcohols, thiols, aldehydes, carboxylic acids, and sulfonic acids.
3. The composition of claim 2 wherein the amines correspond to the formula $\text{P-N-R}_x \text{H}_M$, wherein P is the polymer side chain derived from olefin, N is nitrogen, R is $\text{C}_1\text{-C}_{20}$ hydrocarbyl, H is hydrogen, M is 1 or 2 and X is (2-M).
4. The olefinic composition of claim 1 where the T_g of the functionalized sidechains is less than -30°C , and the T_m of the sidechains is greater than or equal to 100°C .
5. The composition of claim 1 wherein said functionalized branched olefin copolymer comprises functionalized sidechains derived from propylene and at least one chain end primary amine functional group, optionally with one or more copolymerizable monomers.
6. The composition of claim 1 wherein said functionalized branched olefin copolymer comprises functionalized sidechains derived from 4-methyl-1-pentene and at least one chain end primary amine functional group, optionally with one or more copolymerizable monomers.
7. A process of making a functionalized branched olefin copolymer comprising reacting a maleated elastomer with an amine terminated olefin polymer.

8. A process of making a functionalized branched olefin copolymer comprising reacting a maleated elastomer with an olefinic polymer containing a chain end heteroatom containing functional group with at least one protic hydrogen.
9. The process of claims 7 or 8, wherein the reacting step is performed in an extruder.
- 5 10. The process of claims 7 or 8, wherein the reacting step is performed in solution.
11. The composition of claim 1 wherein said functionalized branched olefin copolymer comprises a functionalized ethylene/alpha-olefin copolymer having a density of less than about 0.89 g/cc, wherein the functionality is capable of reacting with a primary amine.
12. The composition of claim 1 wherein said functionalized branched olefin copolymer
10 comprises a functionalized propylene/alpha-olefin copolymer having a density of less than about 0.87 g/cc, wherein the functionality is capable of reacting with a primary amine.
13. The composition of claim 1 wherein the functionalized copolymer is formed from components comprising an unsaturated organic compound containing at least one olefinic unsaturation and at least one carboxyl group or at least one derivative of the carboxyl group
15 selected from the group consisting of an ester, an anhydride and a salt.
14. The composition of claim 13 wherein the unsaturated organic compound is selected from the group consisting of maleic, acrylic, methacrylic, itaconic, crotonic, alpha-methyl crotonic and cinnamic acids, anhydrides, esters and their metal salts and fumaric acid and its ester and its metal salt.
- 20 15. A thermoplastic elastomer composition derived from at least two functionalized olefin copolymers, each copolymer derived from olefins capable of insertion polymerization and each copolymer having a T_m difference of at least 40°C, the composition having A) a $T_g < -10^\circ\text{C}$ as measured by DSC; B) a $T_m > 100^\circ\text{C}$; C) an elongation at break of greater than or equal to 500 percent; D) a Tensile Strength of greater than or equal to 1,500 psi (10,300
25 kPa) at 25°C; E) a TMA temperature $> 80^\circ\text{C}$, and F) an elastic recovery of greater than or equal to 50 percent, wherein at least one functionalized copolymer is chain end functionalized with at least one chain end nucleophilic heteroatom containing functional group with at least one protic hydrogen.

16 The composition of claim 15 wherein the at least one chain end nucleophilic heteroatom containing functional group with at least one protic hydrogen is an amine. (primary or secondary).

5 17. A thermoplastic elastomer composition derived from at least two functionalized olefin copolymers, each copolymer derived from olefins capable of insertion polymerization and each copolymer having a T_g difference of at least 40 °C, the composition having A) at least one $T_g < -10^\circ\text{C}$ as measured by DSC; B) an elongation at break of greater than or equal to 500 percent; C) a Tensile Strength of greater than or equal to 1,500 psi (10,300 kPa) at 25°C; D) a TMA temperature $> 80^\circ\text{C}$, and E) an elastic recovery of greater than or equal to
10 50 percent, wherein at least one functionalized copolymer is chain end functionalized with at least one chain end nucleophilic heteroatom containing functional group with at least one protic hydrogen.

18. The composition of claims 15 or 17, wherein the composition has an additional T_g of greater than about 80°C .

15 19. The composition of claims 15 or 17, wherein the two functionalized olefin copolymers are selected from the group consisting of maleated elastomer and amine terminated olefin polymers.

20 20. The composition of claims 15 or 17, wherein one of the functionalized olefin copolymers is selected from the group consisting of maleated elastomers, and one functionalized olefin copolymer is selected from amine terminated olefin polymers.

21. An olefin composition comprising a functionalized branched olefin copolymer containing functionalized sidechains derived from ethylene and at least one chain end nucleophilic heteroatom containing functional group with at least one protic hydrogen, optionally with one or more copolymerizable monomers, the copolymer having A) at least
25 one $T_g < -10^\circ\text{C}$ as measured by DSC, B) an elongation at break of greater than or equal to 500 percent; C) a Tensile Strength of greater than or equal to 1,500, psi (10,300 kPa) at 25°C; D) a TMA temperature $> 80^\circ\text{C}$, and E) an elastic recovery of greater than or equal to 50 percent.

30 22. The composition of claim 21, wherein the copolymer further comprises an additional T_g of greater than about 80°C .

23. An olefin composition comprising a functionalized branched olefin copolymer containing functionalized sidechains derived from propylene and at least one chain end nucleophilic heteroatom containing functional group with at least one protic hydrogen, optionally with one or more copolymerizable monomers, the copolymer having A) at least one $T_g < -10^\circ\text{C}$ as measured by DSC, B) an elongation at break of greater than or equal to 500 percent; C) a Tensile Strength of greater than or equal to 1,500, psi (10,300 kPa) at 25°C ; D) a TMA temperature $>80^\circ\text{C}$, and E) an elastic recovery of greater than or equal to 50 percent.
24. An olefin composition comprising a functionalized branched olefin copolymer containing functionalized sidechains derived from 4-methyl-1-pentene and at least one chain end nucleophilic heteroatom containing functional group with at least one protic hydrogen, optionally with one or more copolymerizable monomers, the copolymer having A) at least one $T_g < -10^\circ\text{C}$ as measured by DSC, B) an elongation at break of greater than or equal to 500 percent; C) a Tensile Strength of greater than or equal to 1,500, psi (10,300 kPa) at 25°C ; D) a TMA temperature $>80^\circ\text{C}$, and E) an elastic recovery of greater than or equal to 50 percent.
25. The composition of claims 15, 17, 21, 23 or 24 wherein the functional group is selected from the group consisting of primary or secondary amines, alcohols, thiols, aldehydes, carboxylic acids, and sulfonic acids.